



**NOTIFICATION OF TRANSMITTAL
OF COPIES OF TRANSLATION
OF THE INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

(PCT Rule 72.2)

From the INTERNATIONAL BUREAU

To:

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Date of mailing (<i>day/month/year</i>) 21 April 2005 (21.04.2005)	IMPORTANT NOTIFICATION
Applicant's or agent's file reference pf-3197	
International application No. PCT/JP2003/009052	International filing date (<i>day/month/year</i>) 16 July 2003 (16.07.2003)
Applicant NEC CORPORATION et al	

1. Transmittal of the translation to the applicant.

The International Bureau transmits herewith a copy of the English translation made by the International Bureau of the international preliminary examination report established by the International Preliminary Examining Authority.

2. Transmittal of the copy of the translation to the elected Offices.

The International Bureau notifies the applicant that copies of that translation have been transmitted to the following elected Offices requiring such translation:

AZ, CA, CH, CN, CO, EP, GH, KG, KR, MK, MZ, RO, RU, TM

The following elected Offices, having waived the requirement for such a transmittal at this time, will receive copies of that translation from the International Bureau only upon their request:

AE, AG, AL, AM, AP, AT, AU, BA, BB, BG, BR, BY, BZ, CR, CU, CZ, DE, DK, DM, DZ, EA, EC, EE, ES, FI, GB, GD, GE, GM, HR, HU, ID, IL, IN, IS, JP, KE, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MN, MW, MX, NI, NO, NZ, OA, OM, PH, PL, PT, SC, SD, SE, SG, SK, SL, TJ, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW

3. Reminder regarding translation into (one of) the official language(s) of the elected Office(s).

The applicant is reminded that, where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report.

It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned (Rule 74.1). See Volume II of the PCT Applicant's Guide for further details.

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer Masashi Honda
Facsimile No.+41 22 740 14 35	Facsimile No.+41 22 338 70 10

Form PCT/IB/338 (July 1996)

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Translation

PATENT COOPERATION TREATY

PCT/JP2003/009052

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference pf-3197	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/JP2003/009052	International filing date (day/month/year) 16 July 2003 (16.07.2003)	Priority date (day/month/year) 16 July 2002 (16.07.2002)
International Patent Classification (IPC) or national classification and IPC H01L 29/78, 21/336, 21/316		
Applicant NEC CORPORATION		

- This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
- This REPORT consists of a total of 7 sheets, including this cover sheet.
☒ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).
These annexes consist of a total of 3 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☒ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 16 July 2003 (16.07.2003)	Date of completion of this report 30 March 2004 (30.03.2004)
Name and mailing address of the IPEA/JP	Authorized officer
Facsimile No.	Telephone No.

Form PCT/IPEA/409 (cover sheet) (July 1998)

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International Application No.

PCT/JP2003/009052

I. Basis of the report

1. With regard to the elements of the international application:*

- ☐ the international application as originally filed
- ☒ the description:
 pages 1-31, as originally filed
 pages _____, filed with the demand
 pages _____, filed with the letter of _____
- ☒ the claims:
 pages 1-3, 5-25, 27-68, as originally filed
 pages _____, as amended (together with any statement under Article 19
 pages _____, filed with the demand
 pages 4, 26, filed with the letter of 19 December 2003 (19.12.2003)
- ☒ the drawings:
 pages 1/16-16/16, as originally filed
 pages _____, filed with the demand
 pages _____, filed with the letter of _____
- ☐ the sequence listing part of the description:
 pages _____, as originally filed
 pages _____, filed with the demand
 pages _____, filed with the letter of _____

2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item. These elements were available or furnished to this Authority in the following language _____ which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☒ The amendments have resulted in the cancellation of:

- ☐ the description, pages _____
- ☒ the claims, Nos. 69-71
- ☐ the drawings, sheets/fig _____

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).**

* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rule 70.16 and 70.17).

** Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement			
Novelty (N)	Claims	9, 12-17, 19-28, 31-33, 35-37, 39, 40, 45, 46, 51-54, 56-64, 67	YES
	Claims	1-8, 10, 11, 18, 29, 30, 34, 38, 41-44, 47-50, 55, 63, 65, 68	NO
Inventive step (IS)	Claims	9, 22-24, 59-64	YES
	Claims	1-8, 10-21, 29-58, 65-68	NO
Industrial applicability (IA)	Claims	1-68	YES
	Claims		NO

2. Citations and explanations

- Document 1: JP 2001-332547 A (Toshiba Corporation), 30 November 2001, paragraphs [0011] to [0026]; [0063] to [0070]; figs. 3, 5 and 9
- Document 2: US 2001/0023120 A (Yoshitaka Tsunashima), 20 September 2001, paragraphs [0134] to [0143]; fig. 8
- Document 3: JP 2002-184773 A (NEC Corporation), 28 June 2002, entire text; fig. 3
- Document 4: JP 62-118559 A (NEC Corporation), 29 May 1987, entire text
- Document 5: JP 58-93331 A (Tokyo Shibaura Electric Co., Ltd.), 3 June 1983, entire text

The inventions set forth in claims 1 to 8, 10, 11, 18, 29, 30, 34, 38, 41-44, 47-50, 55, 65, 66 and 68 are disclosed in document 1, and therefore lack novelty and do not involve an inventive step.

The inventions set forth in claims 19 to 21 and 56 to 58 do not involve an inventive step in the light of documents 1 and 2. Document 2 sets forth a method of forming a gate insulating film comprising a metal silicate film, wherein a metal film is formed on top of a silicon oxide film, and after heating, the unreacted metal area is

removed. It would be easy for a person skilled in the art to conceive of applying the technique set forth in document 2 to the invention set forth in document 1, in order to obtain a gate structure with the desired characteristics.

The inventions set forth in claims 12, 31, 45 and 67 do not involve an inventive step in the light of documents 1 and 3. Document 3 sets forth a method of forming an insulating film with a high dielectric constant, wherein a silicon oxide film is formed on a substrate, metal is formed on top of said silicon oxide film, which is then heated to form an insulating film. In this method, the partial pressure of residual oxygen is controlled in order to control the thickness of the silicon oxide film formed on the substrate interface. In the invention set forth in document 1, metal is formed on a silicon oxide film then heated to form an insulating film with a high dielectric constant, therefore the invention set forth in document 1 is understood to also address the problem of controlling the thickness of a silicon oxide film formed at a substrate interface.

It would therefore be easy for a person skilled in the art to employ the technique set forth in document 3 in the invention set forth in document 1, taking said problem into account. Moreover, the values could be optimized by trial and error by a person skilled in the art, therefore specifically limiting these values lacks critical significance.

The inventions set forth in claims 13 and 46 do not involve an inventive step in the light of document 1. It is a known technique in common practice to heat a substrate when forming a film on said substrate, therefore it would be easy for a person skilled in the art to employ

the aforementioned commonly practiced technique in the invention set forth in document 1 in order to control the reaction between the silicon oxide film and the metal film, to form an insulating film with the desired characteristics.

The inventions set forth in claims 14 to 17 and 51 to 54 do not involve an inventive step in the light of document 1. In the invention set forth in document 1, the thickness of a silicon oxide film formed on top of a substrate and the thickness of a metal film formed on top of said silicon oxide film are design features, and could be optimized through trial and error by a person skilled in the art in order to form an insulating film with the desired characteristics, therefore specifically delimiting these thicknesses is not critically significant.

The invention set forth in claims 32 and 33 does not involve an inventive step in the light of documents 1 and 4. Document 4 sets forth a technique of forming a silicon nitride film between a metal oxide film and a polycrystalline silicon electrode in order to prevent reactions at the interface between a polycrystalline silicon electrode and a metal oxide layer. It would therefore be easy for a person skilled in the art to employ the technique set forth in document 4 in the invention set forth in document 1, in order to prevent a reaction between the gate electrode and the gate insulating film.

The invention set forth in claims 39 and 40 does not involve an inventive step in the light of documents 1 and 5. Document 5 sets forth a technique of forming a metal silicate film by reacting a silicon oxide film with metal in a reducing atmosphere. It would be easy for a person

skilled in the art to employ the technique set forth in document 5 in the invention set forth in document 1 in order to obtain a metal silicate film with the desired characteristics.

The invention set forth in claims 35 to 37 does not involve an inventive step in the light of document 1. In the invention set forth in document 1, the thickness of the silicate layer and the thickness of the layer which does not include metal elements are design features, and could be optimized by trial and error by a person skilled in the art in order to form an insulating film having the desired characteristics, therefore it would be easy for a person skilled in the art to stipulate the relationship of the size of these film thicknesses. Moreover, specifically delimiting these film thicknesses lacks critical significance.

With regard to the inventions set forth in claims 9, 22 to 28 and 59 to 64, none of the documents cited in the international search report sets forth a gate insulating film structure, wherein a composition of a metal element in the thickness direction of the film has a composition modulation which is low in the lowermost part and uppermost part in the proximity of the silicon area, and high in the central part, and said feature would not be obvious to a person skilled in the art.